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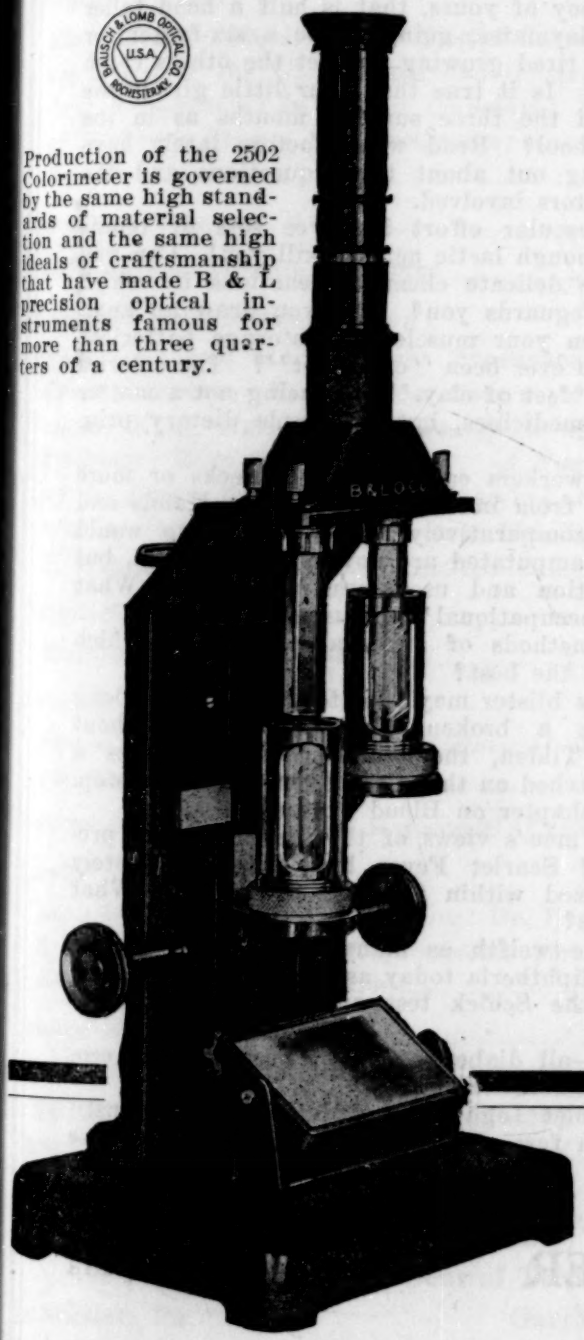

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IRA REMSEN

Two men, Ira Remsen and Wilhelm Ostwald, stand out during the last fifty years as great teachers and as founders of chemical journals which have had a profound influence on the development of chemistry. In these two respects their work is comparable with that of Liebig during the middle of the nineteenth century.

Ira Remsen was born in New York City, February 10, 1846. His parents were both descended from the early Dutch settlers of New York and his mother had also Huguenot blood in her veins. For two years, from eight to ten, the boy lived in the country and had that intimate contact with nature which is impossible for a lad who spends his life exclusively in a city. A part of his early education was received in country schools. After further study in the public schools of New York City he entered the Free Academy, now the College of the City of New York, where he studied Latin, Greek, mathematics, history and a very little science. He did well in Latin and Greek and it was doubtless during those years that he laid the foundation for that perfect command of accurate English which has made it such a delight to read his books and to listen to his lectures. His interest in science seems to have been awakened at this period by the popular, illustrated lectures given by Dr. Doremus at the Cooper Institute.

He did not, however, complete the four years of work required for graduation at the Free Academy. Many years later he received the bachelor's degree from the College of the City of New York, as of the class of 1865. He was accustomed to say, with some pride, that he was one of the few men who had received the rank of M.D. from the College of Physicians and Surgeons without having received the bachelor's degree. He also said, at one time, that he thought he was the only university president in America who had not completed a four years' college course.

After a few years in the Free Academy, Remsen's father decided that he should become a physician and apprenticed him to a doctor who taught in a homeopathic medical college. Here he read some chemistry and tried some chemical experiments for himself, sometimes with disastrous results to his fingers and clothing, as he told his students in recalling those days. He attracted the attention of his preceptor, however, and was made lecture assistant and quiz instructor in the college.

He soon revolted at the inefficient instruction and induced his father to send him to the College of Physicians and Surgeons of Columbia University. At the age of twenty-one he graduated and was supposed to be ready for the practice of medicine.

Once more he refused to be guided by the wishes of his father and, instead of entering a desirable partnership, which was offered him, with a well-known physician, he set out for Germany to study chemistry.

Liebig's name had attracted him to Munich and he had not learned that the great master had given up the direction of students some time before and had gone to the Bavarian University with the understanding that he could devote his time to his own studies and writing and that his duties should consist in giving a single course of lectures in inorganic chemistry. Remsen was forced to study with an able *Privatdocent,* Jacob Volhard. From him he received his first systematic laboratory instruction. Before that he had never performed the simplest analysis. Thorough training in analytical chemistry was, at that time, considered to be the only routine laboratory work necessary for the preparation of a chemist to begin research, and we may be sure that the fundamental basis for his career was well laid during this year of intimate association with Volhard.

During the summer of 1868, Wöhler made one of his friendly visits to Liebig and through Volhard, Remsen was introduced to him and arranged to go to Göttingen in the fall. There he began research work under the direction of Fittig and two years later received his degree of Ph.D. at the age of twenty-four. When we remember that Remsen spent only one year in the systematic study of chemistry and two years in research in earning his degree, we are tempted to question whether the long years of routine instruction which are required of young chemists to-day do not tend to dim that eager enthusiasm and repress the initiative so invaluable for a successful career.

It does not follow, however, that because Remsen did not take the varied courses of routine lectures which we expect of students to-day he failed to become very thoroughly acquainted with the chemistry of his times. He once told me that during his stay in Germany he read the volumes of Liebig's *Annalen*—150 volumes had been published in 1870—until he was acquainted with all the important papers published in that journal.

The same year that Remsen received his doctor's degree, Fittig was called to the professorship at Tübingen and he asked Remsen to go with him as his lecture and laboratory assistant. He continued in this position for two years and in this way, for five years in all, he drank in the spirit of the German laboratories.

It was a fortunate time for the eager, enthusiastic young man. In 1858 Canizzaro had shown the importance of Avogadro's principle and laid the foundation for a system of true atomic weights. The same year, Couper and Kekulé extended Frankland's doctrine of valence to explain the structure of carbon compounds, and hundreds of professors and students were working together, after the model of Liebig's laboratory, in the fascinating world of organic chemistry.

It was at Tübingen, too, that a young Scotchman rang at the door one day and asked, in broken German, for the "Vorlesungszimmer." Remsen answered, "Oh! I guess you want the lecture room." So there was begun the life-long friendship with Sir William Ramsay. Only a few months before his death, Sir William wrote to Remsen, "Well, I am tired and must stop. I look back to my long friendship with you as a very happy episode in a very happy life; for my life has been a very happy one." When Remsen helped with the plans of the Kent Chemical Laboratory of the University of Chicago, he provided few rooms for isolated students and he made the remark that students learn more from each other than from their teachers. When two such students as Ramsay and Remsen met, we can well believe that this was true.

Remsen returned to America in 1872 and, after some delay, was appointed professor of chemistry and physics at Williams College. When he assumed his duties he found no laboratory and scant encouragement to teach science other than as a small element of general "culture" in an old-fashioned classical college. After a year, he was furnished a laboratory for his own use and there he carried on researches on the action of ozone on carbon monoxide—a subject to which he returned some years later—and on parasulfobenzoic acid. The latter led to an attempt to oxidize orthosulfobenzoic acid and its sulfamide and this, in turn, led to a long series of investigations carried out with students at the Johns Hopkins University. These studies finally established "Remsen's Law" that groups in the ortho position interfere with the oxidation of alkyl groups of aromatic compounds by means of chromic or nitric acid.

As an illustration of the spirit of the New England colleges of that day, the following incident related by Professor J. M. Kingsley is illuminating:

> In the autumn of 1874, together with the rest of the junior class in Williams College, I began the study of chemistry under Professor Ira Remsen. After a few days I asked him for the privilege of carrying my studies farther in his private laboratory, as there was no laboratory work connected with the regular course. He replied to the effect that he would have to lay my request before the faculty, as there was no provision for such work in

the curriculum. A few days later he asked me to stop after the class was dismissed, and then he informed me, in the most disgusted tones, that "The Faculty, *in their wisdom*, have decided that you would break too much glassware and waste too many chemicals to allow you to work in my laboratory."

Kingsley became a zoologist of note instead of a chemist.

Shortly after his return to America, Remsen published a translation of Wöhler's "Organic Chemistry." He also published a beautifully written "Theoretical Chemistry." These books, and still more his persistence in research under discouraging conditions, attracted the attention of President Gilman, who was seeking men for his faculty at the Johns Hopkins University. He had already secured Gildersleeve for Greek, Rowland for physics and Sylvester for mathematics. Remsen was invited to Baltimore to meet the Board of Trustees and was entertained at a dinner at which he was seated beside one member of the board after another. In this way Professor Remsen became one of that galaxy who worked with President Gilman to organize the first genuine university in America, where more than half the students were graduates of other colleges and where the purpose was not so much to teach what is already known as to develop men into productive scholars and add to the world's knowledge. President Gilman had the somewhat rare quality of fully trusting the men he selected and allowing them to develop the work of their departments without interference. His injunction to Remsen was, "Do your best work in your own way."

Professor Remsen followed rather closely the models with which he had become so familiar in Germany. He gave lectures on inorganic chemistry during the first semester and on organic chemistry, the second. These were well illustrated with experiments and he had a crystal-clear, masterful method of presenting his subject. Once a week there was a meeting of graduate students for reports on current literature.

But the most important and vital part of his instruction was the daily visit to the desk of each research student. Often, at critical points, he would stop and work for minutes or for an hour or more with the student, and the product, in the end, was the joint work of professor and student, as it had been in Liebig's laboratory. Most of the topics studied grew, directly or indirectly, from his investigation of the oxidation of para- and orthosulfobenzoic acid and the law of the protection of ortho alkyl groups from oxidation.

Quite early in the course of these studies, Fahlberg, working under his direction, discovered that the orthosulfamide of benzoic acid may be easily oxidized by potassium permanganate in a neutral or faintly alkaline solution. The product was called by Remsen benzoic sulfinide. It is several hundred times as sweet as sugar and some years later Fahlberg developed the commercial production of the compound under the name of saccharin.

The discovery of benzoic sulfinide naturally led to the investigation of many other similar compounds. This also led, rather directly, to the discovery of the sulfonephthaleins and the study of the chlorides of sulfobenzoic acid. Professor Reid reports how he came to study the decomposition of diazonium compounds with alcohol. The laboratory book said "add alcohol and smell the aldehyde." A student came to him and said he did not smell aldehyde. Remsen took the tube and could not smell aldehyde either. He made this into a good story, telling how stubborn the student was who wouldn't smell aldehyde when told to do so.

The work of Professor Remsen and his students never degenerated into the mere preparation of new compounds. He always endeavored to establish some general principle in relation to the substances prepared.

In 1883 Professor Remsen came back to the action of ozone on carbon monoxide and a very careful investigation demonstrated that the latter is not oxidized when the mixture with ozone is heated to 300° and the ozone is completely decomposed. He also, in an investigation which proved that phosphorus usually contains a little carbon, demonstrated that carbon monoxide is not oxidized when mixed with air and passed over moist phosphorus, although ozone is formed in quantities. A satisfactory theoretical explanation of these remarkable results is still to be found.

In 1889 Professor Remsen made an exhaustive study of the literature of the double halides and found that, with very few exceptions, the number of mols of an alkali halide combined with one mol of another halide is equal to or less than the number of atoms of chlorine in the other halide. A considerable number of experimental investigations were carried out with his students to test the validity of this generalization. The conclusion that two chlorine atoms unite to form a bivalent group has not been generally accepted and does not agree well with the more recent electronic theories of chemical combination.

When Remsen went to Johns Hopkins University in 1876, there was no satisfactory medium in America for the publication of an account of his researches. A few of his articles were published in *The American Journal of Science,* but Professor Dana, the editor of that journal, soon decided that researches in organic chemistry did not furnish material of sufficient interest to his readers and advised publication abroad.

Professor Remsen was not satisfied with this and, with the aid of other chemists, he established *The American Chemical Journal*. With far-sighted vision, he made this a medium of publication for American chemists and not an organ of the Johns Hopkins University. For thirty-five years this journal was a very important agency for the promotion of genuine chemical work. It was the first American journal in this field which secured widespread recognition abroad and it would be difficult to overestimate its value in stimulating chemical work and in placing Americans in their rightful place among the chemists of the world. At the close of the fiftieth volume President Remsen decided that publication in America would be better served by incorporation of *The American Chemical Journal* with *The Journal of the American Chemical Society*. This was done and the latter journal carries on its title page a record of the consolidation of the two journals.

Remsen's first book was a "Theoretical Chemistry," written while he was at Williams College. It passed through five editions and was translated into German and Russian. His "Organic Chemistry" was published in 1883 and has been the medium through which many chemists, physicians and others have been introduced to the subject. His text-books of "Inorganic Chemistry," both elementary and advanced, are characterized by a logical, lucid style which has made them very popular and widely used. The "Organic Chemistry" was translated into many foreign languages and several of the other books were also translated.

A long series of students, trained in intimate association with Professor Remsen, are now widely scattered and many of them hold important positions as teachers and in the industries. They look back to him as to a father, who always required high quality in their work, who was wise in his advice and helpful in their difficulties.

Professor E. E. Reid writes, "It is impossible to characterize or describe Remsen. He had a keen sense of humor and a ready wit, a personality in the fullest sense of that term. He drew people to him but always kept them in their place."

In 1881 Boston had trouble with her water supply and Professor Remsen was called upon for his advice. He was fortunate enough to discover the cause of the difficulty. On many other occasions he was called upon for public services to Baltimore, Maryland and the United States. He was for some years a member of the Good Roads Commission of the state.

In 1901 Remsen succeeded D. C. Gilman as president of Johns Hopkins University. The resources of the university had been depleted by the depreciation of some of its securities and the period of his administration was a difficult one. In spite of this, the university continued its steady and satisfactory development. The school of engineering was founded and the cramped quarters in the heart of the city were exchanged for the magnificent campus which the university now occupies in the outskirts of Baltimore.

President Remsen retired in 1913. After that he spent his time in travel, in revising his books, in work for the government as chairman of the Referee Board organized during Roosevelt's administration to consider questions pertaining to the law for the control of food products and their adulteration, and in consulting work for one of our largest industrial corporations. He died at Carmel, California, in 1927, at the age of eighty-one.

He was the recipient of many honors. The degree of LL.D. was conferred by Columbia, Princeton, Yale, Toronto, Harvard and Pennsylvania. He was a foreign fellow of the London Chemical Society and foreign member of the French Chemical Society. In 1902 he was president of the American Chemical Society; in 1903, of the American Association for the Advancement of Science. During 1907–13 he was president of the National Academy of Sciences. In 1908 he was awarded the gold medal of the Society for Chemical Industry and in 1910 was president of that society. In 1914 he received the Willard Gibbs medal of the Chicago Section of the American Chemical Society.

In his boyhood Remsen was reared in a very strict, religious atmosphere and he retained a simple religious faith throughout his life. In his address "On the Life History of a Doctrine," delivered as president of the American Chemical Society, after pointing out that "faith is called for at every turn in scientific matters as well as spiritual," he said, "It would be as illogical to give them (atoms) up as it is, in my opinion, to deny the existence of a power in the universe infinitely greater than any of the manifestations familiar to us; infinitely greater than man; a power that 'passeth all understanding.'"

WILLIAM A. NOYES
UNIVERSITY OF ILLINOIS

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

THE RENO MEETING OF THE PACIFIC DIVISION—II

AMERICAN PHYTOPATHOLOGICAL SOCIETY, PACIFIC DIVISION

(*T. E. Rawlins, secretary pro tem.*)

The Pacific Division of the American Phytopathological Society met on June 23. The first paper, by W. T. Horne, discussed the fruit decays of the feijoa.

Botrytis cinerea Pers. was reported as the most common cause of decay in this fruit, with *Penicillium expansum* Lk. second in importance.

J. P. Bennett described a method of treating pear trees with ferric citrate for the control of lime-induced chlorosis.

The addition of a small amount of peat soil to a fertile potting soil was reported by T. E. Rawlins to treble the early growth of celery in this soil; the possibility of this increased growth being due to the celery mycorhiza was discussed.

Experiments reported by M. Shapovalov gave evidence that the western yellow tomato blight is transmitted by *Eutettix tenella* Baker. Typical disease symptoms were only produced under proper environmental conditions. It was suggested that the name of the disease be changed to "tomato yellows." This change was approved by the society.

H. S. Fawcett and W. R. Barger reported that the maximum rate of decay of citrus fruits by *Penicillium italicum* and *P. digitatum* was produced at temperatures between 66.8° and 80.6° F., temperatures above and below these limits being less favorable for decay. In most cases the rate of decay was much more rapid at the stem-end than at the stylar end of orange fruits.

A paper by L. J. Klotz on the enzymes of *Pythiacystis citrophthora* Sm. and Sm. reported positive evidence for the presence of the following enzymes in the mycelium of this fungus—lower esterases, diastase, invertase, maltase, emulsin, phloridzinase asparaginase, urease, peroxidase and catalase. An improved method of determining enzyme activity was described.

F. N. Briggs reported experiments in dehulling barley seed with sulphuric acid to induce infection with covered smut, *Ustilago hordei*.

Experiments on the influence of various environmental factors on the development of the curly-top disease of sugar beets were described by W. Carter.

Botanical Society of America, Pacific Division

(J. P. Bennett, secretary, Berkeley, California)

The Botanical Society of America held three half-day sessions on June 22 and 23. From 30 to 50 people were present at each session. Twenty-three papers were presented.

The following officers were elected for 1927–1928:

D. R. Hoagland, *president;* University of California, Berkeley, California.

G. M. Smith, *secretary;* Stanford University, California.

Ecological Society of America

(A. G. Vestal, Secretary for the Reno meeting, Stanford University)

The Ecological Society of America held a joint session with the Western Society of Naturalists, as fully reported by the secretary of that society. It may be said here that the excursion to Pyramid Lake on Friday, in which all the ecologists attending the meeting participated, proved of unusual interest to the ecologists.

Pacific Coast Entomological Society

(E. P. Van Duzee, secretary pro tem., San Francisco)

The Pacific Coast Entomological Society met in the Agriculture Hall, with 37 members and visitors in attendance. In the absence of the regular officers of the society Mr. E. P. Van Duzee called the meeting to order and proposed Professor C. W. Woodworth as chairman *pro tem.* Mr. Van Duzee was asked to act as secretary for the meeting. There was no formal program, but Dr. G. Dallas Hanna gave a most interesting talk on his experiences in collecting insects in Alaska during the years he was engaged in government work there, and Dr. Frank R. Cole told of some studies he had made on the curious flies belonging to the genus *Diopsis,* and later also gave some account of the insect collecting he had done during his residence in Florida. A general discussion of these matters and notes by other members and visitors filled the time of the meeting.

San Francisco Aquarium Society

(C. J. MacMeekin, secretary, Mill Valley, Calif.)

The San Francisco Aquarium Society held one joint session with the Western Society of Naturalists and participated in the excursion to Pyramid Lake.

Western Plant Quarantine Board

(W. C. Jacobsen, secretary, Sacramento, California)

The ninth annual conference of the Western Plant Quarantine Board was held immediately preceding the regular sessions of the Pacific Division.

This board was organized in 1919 at Riverside, California, under the leadership of Mr. G. H. Hecke, the present director of agriculture for California. Its territory includes the eleven western states, also Hawaii, the State of Lower California, Mexico and the Province of British Columbia, Canada.

It was the first, hence the pioneer, regional plant quarantine board, of which there are now four cover-

ing the entire United States. These four regional boards are further coordinated by the National Plant Board, a foster-parent in touch closely with national quarantine matters. It is unique in that it incorporates in its membership representatives from territories outside of the United States.

The Reno session of the board necessarily attended to matters of vital interest to the western area, involving similar plant quarantine action against pests found in other sections of the United States, discussion of uniform basic quarantine laws passed by recent legislatures and the harmonizing of state quarantines pertaining to quarantinable commodities moving between the several states and territories represented.

Chairman Oscar Bartlett, state entomologist of Arizona, presented clearly the importance of detailed and careful inspections of vehicles crossing state boundaries as a means of preventing the introduction and spread of serious plant pests, also emphasizing the readiness of dangerous insects to enter from parts of Mexico unless a consistent and vigilant check is kept on all incoming plant commodities.

The recent introduction of the Mexican fruit fly into Texas was discussed by G. H. Hecke, pointing out that this dangerous insect was the first representative of a group of seriously destructive *Trypetidae* to become established in the United States. He clearly defined the menace presented and spoke of the importance of eradicating it and suppressing further spread by necessary quarantine action under the leadership of the Federal Horticultural Board.

The determined attitude taken by Secretary Jardine in maintaining a rigid quarantine against Spanish grapes because of Mediterranean fruit fly infestation was commended.

There were general discussions on the control of European earwig and insect pests of narcissus bulbs, the latter by Chas. F. Doucette and Dr. Frank Cole of the U. S. Bureau of Entomology. Other pests under consideration were Mexican bean beetle, alfalfa weevil, Colorado potato beetle, Thurberia weevil, and pink bollworm of cotton.

An important feature of the meeting was the submission of detailed lists and reports on economic pests, both insects and diseases, in the various states represented in connection with the reports on quarantine conditions in each state during the year preceding.

Two official representatives from the Mexican Department of Agriculture and Development, Dr. Alfons Dampf, chief entomologist, and Mr. Enrique Coppel Rivas, inspector general of fumigation and plant quarantines, indicated the progress being made in Mexico in the matter of pest detection and control, as well as detailed reference to the procedure in effect in the three west coast states of Mexico, namely, Sonora, Sinaloa and Nayarit, to prevent introduction of dangerous insects existing in other portions of the Republic of Mexico. This area was, until the spring of 1927, quite isolated, but is now made more subject to pest introduction and distribution by the completion of a new rail line. New regulations are in effect in Mexico against Mediterranean fruit fly hosts from foreign countries. The importance of their cooperation with our western states on the Pacific Coast was emphasized.

To the end that there might be a better understanding between pest conditions in Mexico and in the United States and the relationship of adequate protection against the introduction into either from each of the countries of dangerous insect pests and plant diseases, there was recommended to the authorities at Washington the creation of an international crop pest commission to make careful study of the entire situation, its findings to be made available in an advisory way to the regularly constituted authorities in each republic.

The value of uniformity in apiary inspection regulations and quarantines brought about the suggestion that a permanent committee be formed within the organization to bring about harmonious action as to quarantine regulations and uniform organization in the various states for the elimination of American foul brood.

A standing committee on pest surveys was continued, as well as a committee on uniform treatments, this latter committee to investigate all methods of treating plant products either by sprays, fumigations, both atmospheric and in vacuum, various dips, dry heat and hot water treatments, etc., in order to determine if any feasible methods could be utilized to make safe the interstate and intrastate movement of pest hosts by secure treatments.

The Western Plant Quarantine Transportation Committee, consisting of representatives of railway and express companies, was in attendance to aid in the correlation of pest prevention methods insofar as common carrier agents could assist.

A further detailed discussion of the value of automobile inspection was presented by A. C. Fleury, of California, basing the same on one full day's interception of pests. Representatives of the Office of Blister Rust Control, C. R. Stillinger and S. N. Wyckoff, explained the program in effect to stem further spread of this disease of white pines through elimination of currants and gooseberries and by quarantine enforcement.

The officers elected for the ensuing year are:

George G. Schweis, *chairman;* entomologist, State of Nevada.

J. I. Griner, *vice-chairman;* horticulturist, Washington State Department of Agriculture, Olympia, Washington.

M. L. Dean, representative on the National Plant Board; director, Bureau of Plant Industry, Idaho Department of Agriculture.

W. C. Jacobsen, *secretary;* chief, Bureau of Plant Quarantine and Pest Control, California State Department of Agriculture, Sacramento.

WESTERN SOCIETY OF FARM ECONOMICS

(P. V. Cardon, secretary, Logan, Utah)

Farm economists of the eleven western states met with the Pacific Division on June 22 and 23, and perfected an organization to be known as the Western Society of Farm Economics. The purpose of this society is to promote understanding among western farm economists relative to economic problems in the respective states, the methods used in studying these problems and the progress made toward their solution. The association will aim also at coordination of effort wherever coordination is practicable.

The society met in the Mackay School of Mines building of the University of Nevada, where they were welcomed by President Walter E. Clark. President Clark opened the conference by outlining some economic problems involved in public land administration in the Intermountain Region. The remainder of the first day was spent in a consideration of projects in agricultural economics as they were outlined by delegates of the states represented. Suggestions for coordination of work and standardizing methods of investigation were offered by B. H. Critchfield, of the U. S. Bureau of Agricultural Economics.

The program of the second day was as follows:

"Investigations in Farm Management," by George L. Sulerud, University of Idaho, read by R. C. Engberg, University of Idaho; discussion led by P. V. Cardon, Utah Agricultural College.

"Investigations in Cost of Production," by R. T. Burdick, Colorado Agricultural College; R. M. Clawson, University of Nevada, and H. D. Scudder, Oregon Agricultural College.

"Marketing Problems," by R. L. Adams, University of California, read by S. W. Shear, University of California.

"Factors affecting the Supply of Farm Products," by E. Rauchenstein, University of California.

"Need of Statistical Measurements in determining and Correctly interpreting the Irrigation Situation," by Charles H. West, University of California.

"Collecting and disseminating Economic, Statistical and Marketing Information," by L. R. Breithaupt, Oregon Agricultural College.

Officers for the ensuing year are: F. B. Headley, University of Nevada, *president;* H. D. Scudder, Oregon Agricultural College, vice-president; P. V. Cardon, Utah Agricultural College, *secretary-treasurer.*

WESTERN SOCIETY OF NATURALISTS

(C. V. Taylor, secretary, Stanford University)

The Western Society of Naturalists held its twelfth annual meeting on June 23, in affiliation with the Pacific Division. As evidence of the continued activity of this biological organization, which alone is distinctly western in origin and representation, it should be noted that the day's program included reports of 20 investigations from eight different research laboratories. The afternoon session was held jointly with the Ecological Society of America.

In his paper, "Contribution to the Replacement of the Linnaean System of Nomenclature," Dr. G. Dallas Hanna said that the Linnaean system of binomial nomenclature of animals and plants, established in 1758, has been a constant cause of dissension ever since. If we accept evolution as a fact we can not assume that all species were created as they now exist and will never change. Nor can we consistently persist in the naming of such assemblages of individuals as we think have common ancestry. We may as well admit that species in the Linnaean sense, created entities, do not exist in nature. Therefore, in addition to dropping the genus as a part of the name it would appear to be advisable to define a species as an individual organism or part of an organism deposited in a public museum and to which a name has been given and duly published. Supposed relatives of this specimen might bear the same name.

Professor S. J. Holmes, discussing "The Differential Mortality of the Negro," concludes that the American Negro is building up an increasing degree of immunity to two of the greatest scourges of the colored race—tuberculosis and pneumonia; further, that Negroes are less susceptible than the whites to scarlet fever, diphtheria, measles and various other maladies. Since, due to both an increasing immunity and improved sanitation, the birth-rate of the Negro, particularly in the north, may probably soon exceed the death-rate, the biological fate of this race is of prime importance in the eventual composition of the American people. In the long run, this question will likely be decided on the basis of differential mortality.

Dr. Laurence Irving reported results of recent studies on phosphoric acid changes in worked mam-

malian muscle. Acid-soluble inorganic phosphorus of cat muscle may be either increased or diminished by brief tetanic stimulation to exhaustion, with apparent corresponding changes in "lactacidogen." Protracted interrupted stimulation, even if not resulting in fatigue, causes increase of the phosphorus and decrease in "lactacidogen."

Howard C. Day presented experimental evidences that show both for structure and behavior distinctly close similarities in the contractile vacuole in *Amoeba, Spirostomum* and *Paramoecium.*

Laura Garnjobst briefly described a new marine *Euplotes* and her method for inducing at will both the encystment and excystment of this species.

From results of recent experiments by methods of microdissection on early developmental phases in the eggs of the starfish *Patrica miniata,* D. M. Whitaker concluded that the "antipolar" yolk or some substance with it is essential for normal invagination and that in grafted halves following a cut through the polar axis the haploid half tends to invaginate sooner than the diploid half.

P. L. Radir reported evidence from experiments on a new marine amoeba, for a monaxial polarity which persists not only throughout the activity of the normal amoeba but also in its reorganization following the excision of either its anterior or its posterior end.

In his paper on "The Fundamentalists and the Origin of Species," Dr. Barton Warren Evermann expressed regret that any biologists felt it necessary for science to be represented at the Scopes trial at Dayton, Tennessee, where the only question before the court was whether John T. Scopes had violated a state law. The question of the origin of species was not before the court.

But why should our people believe in the evolutionary origin of species when they have had no opportunity in our schools to make any study of species of animals and plants, the only way by which any one can get any clear conception of what a species is or how species originate? A recent survey of the curricula of the 302 high schools in California showed that only a negligible percentage of the 126,000 pupils enrolled were afforded any chance whatever to study species of animals or plants. Systematic zoology and systematic botany as school subjects are no longer thought worth while; so our children go through the schools without ever getting any experience in the study of species and therefore leave the schools ignorant of the facts and principles of the evolutionary origin of species.

In his studies on "Luminescence of a Cirratulid Worm," Professor A. R. Moore found that luminescence of the cirri may yield light of brightness equal to 6 milliamberts. Exposure to clear sunlight for half an hour scarcely affects the luminescence of the live worm, but the luminescent material obtained by crushing the worm on filter-paper is destroyed by sunlight in about thirty seconds, and by exposure for nine minutes to a 6,000 candle meter light. Failure of light to inhibit luminescence in the living worm is presumably due to the rapid synthesis of the luminescent material.

Francis G. Gilchrist reported the results of experiments in which he subjected amphibian (*Triturus torosus*) eggs in their cleavage stages to a horizontal temperature gradient. The primary polarity of the eggs and the fundamental bilaterality were not certainly affected, but the subsequent development of the dorsal axial structure was markedly influenced.

In her paper on "The Flora of Guadalupe Island, Past and Present," Miss Alice Eastwood said that on account of the great number of endemic species that have been found on the island, the flora is peculiarly interesting and is rapidly being destroyed by the goats that were introduced many years ago to furnish fresh meat to mariners in danger of scurvy and which have increased without the restrictions of natural enemies. In looking over the small collection made on the island by H. L. Mason on the Expedition of the California Academy of Sciences to the Revillagigedo Islands in 1925, it seemed desirable to bring together the scattered records of the various collections made on the island, showing the gradual extermination of species, the introduction of some, generally weeds, and the relationship of the flora to that of the mainland.

Dr. Walter Carter reported experiments in spraying sugar beets with various light-absorbing pigments to determine influence of illumination on susceptibility to curly-top disease and on partial resistance to it. Interception of heat-producing rays proved beneficial.

Dr. W. S. Cooper's studies of the dune area northeast of Monterey, which were greatly aided by airplane photographs, correlated the older extensive dunes with a period of uplift and the younger dunes near the present shore with more recent subsidence. He pointed out how ecology may contribute to geology. Available moisture in a California locality for 1923–24 was less than one fifth of that for 1926–27, as shown by Dr. A. G. Vestal. Soil-texture data confirmed his observation that soils of chaparral habitats are generally coarser than those of grasslands.

In his paper on "Some Experiments in changing Young Salmon from Fresh to Salt Water," Alvin Seale said that during the past year the experiments had been conducted at Steinhart Aquarium with the

young of the Chinook salmon, *Oncorhynchus tschawytscha*. The fishes were taken from the hatchery, their age and size were recorded, the conditions under which the experiments were conducted were under perfect control, all sudden changes of temperature were avoided, and specific gravity and temperature readings were taken each morning.

Professor G. J. Peirce reported further studies on crystallizations in brines taken from the Bay of San Francisco. As observed under high magnification, particles of foreign matter come to be incorporated into the growing crystal. If unicellular algae are thus entrapped, they will demonstrate the pressure developed in the growing crystal, for their pear-shaped cells will be pressed into slender spindles. These spindles do not resume their original shape when the crystal containing them is dissolved, which indicates that a very considerable force attended their compression. On the other hand, grains of starch, droplets of oil and other bodies of relatively simple chemical compound are not deformed, showing that their mechanical strength is greater than that of protoplasm, which is composed of several or many compounds.

The "Distribution of Nudibranchiate Mollusca" was discussed by Professor F. M. MacFarland, whose extensive studies on this problem are conclusive in showing that the more uniform conditions of Arctic seas permit the wide distribution of a single or small number of species of each genus, which, extending southward, has become split up into an increasingly larger number of species in response to the diversified environmental conditions met with. More temperate and tropical waters contain forms whose affinities indicate utilization of former marine connections across Central America and between the Mediterranean and the Indo-Pacific seas.

Following are the officers of the Pacific Division American Association for the Advancement of Science for 1927–1928, elected at the Reno meeting:

President: C. A. Kofoid, professor of zoology, University of California.

Vice-president: Ernest G. Martin, professor of physiology, Stanford University.

Secretary-Treasurer: A. G. Vestal, Stanford University, California (to take effect October 1, 1927).

EXECUTIVE COMMITTEE OF THE PACIFIC DIVISION

Ernest G. Martin, *chairman*, professor of physiology, Stanford University, California.

C. A. Kofoid, professor of zoology, University of California, Berkeley.

Walter S. Adams, director, Mount Wilson Observatory, Pasadena (1928).

Bernard Benfield, consulting engineer, Kohl Building, San Francisco (1929).

Joel H. Hildebrand, professor of chemistry, University of California, Berkeley (1929).

Leonard B. Loeb, associate professor of physics, University of California, Berkeley (1931).

Emmet Rixford, professor of surgery, Stanford University, 1795 California Street, San Francisco (1928).

J. O. Snyder, professor of zoology, Stanford University (1930).

O. F. Stafford, professor of chemistry, University of Oregon, Eugene (1930).

W. W. SARGEANT,
Secretary.

SCIENTIFIC EVENTS

THE MEDICAL SCHOOLS OF THE UNITED STATES

THE Secretary of the Council on Medical Education and Hospitals of the American Medical Association, Dr. N. P. Colwell, in a statement made public on July 11 by the Bureau of Education, Department of the Interior, reports that during the past two years changes made in medical schools in the United States have been chiefly in the erection of new buildings, improvement of teaching staffs, the rearrangement of subjects in the curriculum, and closer affiliations with hospitals, with increased opportunities for students personally to study diseases at the bedside in dispensaries and hospitals.

The number of medical schools fluctuated from 80 in 1923 to 79 in 1924, when the General Medical College of Chicago was discontinued, and back to 80 in 1925, when the University of Rochester School of Medicine and Dentistry was added. In 1926 the charter of the Kansas City College of Medicine and Surgery was revoked, but a new institution was promptly chartered to take its place under the name of the American Medical University of Kansas City.

During the past two years the number of medical students has continued to increase. Instead of only 12,930 in 1919, the number increased to 17,728 in 1924; to 18,200 in 1925; to 18,840 in 1926; and to 19,532 (estimate) in the session of 1926–27.

The number of graduates also increased from 2,529 in 1922 to 3,562 in 1924 and to 3,974 in 1925, but decreased to 3,962 in 1926. Although the number of medical schools has remained at about 80 since 1920, the numbers of both students and graduates have increased.

At the beginning of the reorganization of medical schools in 1906 the 162 medical schools then existing enrolled 25,204 students, an average of 156, and turned out 5,364 graduates, an average of 33. Last year (1926), however, the 79 medical colleges in the United States enrolled 18,840 students, an average

of 238, and turned out 3,962 graduates, an average of 50. During the past few years, indeed, the medical schools rated in Class A have been filled almost to capacity.

The movement toward the building of larger teaching plants, including both medical schools and hospitals, continues. During 1925 and 1926 such enlarged plants have been established and partially completed at the Universities of Colorado, Columbia, Illinois, Ohio, Rochester (N. Y.), Vanderbilt, Western Reserve, Wisconsin, and Meharry Medical College. Those which are nearing completion or are partly occupied are of the Universities of Chicago, Northwestern, Tennessee, and the Detroit Medical College. Medical centers with more modern buildings erected nearer to teaching hospitals are being established by the medical schools of George Washington, Georgetown, and Howard Universities at Washington, D. C., and also by Temple University at Philadelphia.

Since 1912 most of the medical schools have limited their enrolments to the numbers which could be given a satisfactory training in medicine, depending on their varying space, equipment and hospital relations. This limitation of enrolments has reduced the attendance in few of the colleges formerly having unduly large enrolments. The capacity of all others remains the same or shows an increase.

The United States still has more physicians in proportion to its population than any other country. In 1925 there was one physician to every 753 people, while Great Britain reports (1921) one physician to every 1,087; Switzerland and Japan reported (1925) one, respectively, to every 1,290 and 1,359; Germany (1912) one to every 1,940; Austria (1912) one to every 2,120; Sweden (1925) one to every 3,500.

In the United States, as in other countries, there has been a tendency during recent years for physicians to locate in cities rather than in rural districts. There is not, however, a shortage of physicians, the problem being one of distribution.

SURVEY LINES OF THE U. S. COAST AND GEODETIC SURVEY

THE records of the Coast and Geodetic Survey show that the distance between its two surveying stations on Mt. Shasta and Mt. Helena, both in California, is 192 miles. This line was used in a survey extended along the 39th parallel to join the surveys and charts of the Atlantic with those of the Pacific coasts of the United States. The system of triangulation involved the measurement of a few lines across country with extreme accuracy by means of metal tapes or base bars. Each of these lines form the side of a triangle, the other sides are computed from this measured line by means of the angles of the triangles observed with high grade theodolites.

The line between Mt. Shasta and Mt. Helena could be used by reason of the employment of very large mirrors in the form of heliographs mounted on each of the stations. By means of the telescope of a theodolite the observer at one station could see, through his instrument, the reflected sunlight as a very dim star on the other peak.

Another long line in the survey across the country by the United States Coast and Geodetic Survey was between Mt. Ellen, Utah, and Uncompahgre Peak, Colorado, the distance being 182.7 miles. There are many lines in the surveys of the Coast and Geodetic Survey which are more than 100 miles in length between stations.

It has been found, in recent years, to be more efficient to use electric signal lamps in the place of heliographs. An ordinary auto headlight with an especially constructed bulb, with contracted filament, has been so effective as to enable the observer to see its light with the unaided eye for distances as great as 150 miles. The electric current used is supplied by ordinary dry cells, such as is used to ring door bells. It was only when the atmosphere was as clear as crystal that the visibility was so perfect. Ordinarily the atmosphere has some haze in it and then the lights do not appear so bright.

The distance that one can see from one part of the earth to another depends on the heights of the mountain peaks and the configuration of the intervening ground. The curvature of the earth is so great that at a very few miles it would be impossible for a man standing at the shore-line of a bay to see a man standing at the shore-line on the opposite side. Where there are deep broad valleys between mountain ranges, the greatest distances can be observed.

EXPLORATIONS IN BRITISH COLUMBIA

ROLLIN T. CHAMBERLIN, professor of geology at the University of Chicago, who with Mr. Allen Carpe, of New York, was the first to climb any of the major peaks of the Caribou range of British Columbia in 1924, has returned to the university after reaching the summits of three new peaks of th erange. Mr. Carpe, a prominent member of the American Alpine Club and one of the famous Mt. Logan expedition in 1925, again was Professor Chamberlin's companion this summer.

The new peaks climbed this summer were Kiwa, with an elevation of 11,400 feet; Mt. Welcome, with an elevation of 11,150 feet, and Mt. Goodell, 10,450 feet high. Kiwa was named for a creek which has its origin in the range, and Goodell was named for "Slim"

Goodell, a packer and trapper of the region, who was a member of the expedition.

To reach the new peaks, Professor Chamberlin and Mr. Carpe back-packed their equipment up grizzly and caribou trails sixteen miles to the end of the Kiwa Glacier. After they had established a camp at an elevation of 4,700 feet, they had considerable difficulty in surmounting two crevassed ice-falls. Several days were required to find a route over which they could pack sleeping-bags and food to a bivouac above the second ice-fall. From this base they climbed Kiwa Peak in five hours, in an interval between heavy snowstorms.

Part of the climbing on Kiwa Peak was done on a snow slope with an angle of 47 degrees, up which every step had to be cut. A part of the descent of Mt. Goodell could be accomplished only by digging out steps, and the two explorers were in imminent danger of snowslides. They spent seventeen days in the mountains, storms and cloudy weather often interfering with their work.

Until the 1924 expedition of Professor Chamberlin and Mr. Carpe, little was known of the range, the locations on the maps differing greatly. Exploratory efforts made by the late Professor E. W. D. Holway, botanist of the University of Minnesota, and Dr. A. J. Gilmour, of New York, in 1916, were rendered unsuccessful by weather conditions. Professor Chamberlin's successful trip in 1924 definitely located the range, which is separated from the Rockies on the east by that part of the Rocky Mountain Trench occupied by the Fraser and McLennan Rivers.

During his exploration of the peaks this summer, Professor Chamberlin gathered data concerning glacial movements which are said to be of considerable interest to geologists.

THE USE OF HUDSON'S STRAITS FOR NAVIGATION

AN important expedition, according to the daily press, has been sent out by the Canadian government, which left Halifax recently for Hudson's Straits. The purpose of this expedition is to investigate the practicability of the use of the Hudson's Straits for navigation for commercial purposes.

Various interests in western Canada that are behind the construction of the Hudson's Bay Railway, the establishment of grain shipping ports on the shores of Hudson's Bay, and a direct sea route to Europe, demanded that such an expedition be sent out to ascertain whether navigation of the Straits can be maintained throughout the year. The expedition is well fitted out to determine over a period of sixteen months exactly what the conditions within the straits are; whether they are closed by ice to such an extent that they will not be practicable for the world's commerce, or whether they are open and can be made a commercial avenue with proper navigation aids, such as lights, buoys, wireless stations, lighthouses and air stations.

The expedition is under the command of Major M. B. McLean, formerly assistant superintending engineer of the St. Lawrence Ship Channel. The personnel numbers about fifty, including three squadrons of the Royal Canadian Air Force, and also full equipment for three wireless stations. These stations are expected to keep the expedition in hourly touch with Ottawa during the whole time the expedition is employed at their work.

The expedition is also provided with a moving picture photographer, under contract with the Federal government, with instructions to film the entire expedition from start to finish. The biological board also sends a representative to make comprehensive study of fisheries.

The expedition sailed in two ships, the Canadian government ship *Stanley,* an ice-breaker, thoroughly reconditioned for her work, and the freighter *Larch,* which carries a cargo of equipment and apparatus which is said to have cost over $1,000,000. Three base stations will be established, one near Port Burwell at the eastern entrance of the Straits, another at Nottingham Island at the western entrance of the Straits, and another halfway between, which will be situated on the north shore of the Straits.

Each station will consist of seven buildings—two dwellings, two hangars, one power-house and two storehouses. There will be two Fokker one-engine airplanes at each station, and the *Stanley* carries a small plane, a *Moth,* for scouting work to locate the sites for the stations. These buildings were all constructed in Halifax and placed aboard the ships ready to be erected as soon as the expedition arrives at its various bases. The supplies which accompany the expedition include 450 tons of coal and 100 tons of food supplies.

LECTURES ON SCIENCE

THE program of public lectures for 1927–1928 given by the Rochester Section of the American Chemical Society follows:

October 3—*Some separations, old and new, by the ionic migration method:* DR. J. KENDALL, New York University, New York.

October 17—Subject of lecture not announced: DR. C. NOLLER, Eastman Kodak Company, Rochester.

November 7—*Medicinals and pharmaceuticals:* DR. A. S. BURDICK, Abbott Laboratories, Chicago.

November 21—MR. E. G. MINER, Pfaudler Company, Rochester.

December 5—*Fuels:* DR. S. W. PARR, University of Illinois, Urbana.

December 19—*Vitamins and ultra-violet light:* DR. ETHEL LUCE, University of Rochester Medical School.

January 9—*Smoke:* DR. G. T. MOORE, Missouri Botanical Gardens, St. Louis.

January 23—DR. K. C. D. HICKMAN, Eastman Kodak Company.

February 6—*Band spectra and molecular structure:* DR. SAUL DUSHMAN, General Electric Company.

February 20—*The discovery of the ovum:* DR. G. W. CORNER, University of Rochester Medical School.

March 5—*Pharmacology:* DR. A. D. HIRSCHFELDER, University of Minnesota, Minneapolis.

March 19—DR. S. E. SHEPPARD, Eastman Kodak Company, Rochester.

April 2—DR. O. MAASS, McGill University, Montreal, Canada.

April 16—*Wood distillation:* MR. I. N. HULTMAN, Eastman Kodak Company, Rochester.

May 7—Some speaker on *Anti-knock fuels.*

May 21—*Electro-metric measurements:* DR. H. C. PARKER, Leeds & Northrup, Philadelphia.

Lectures at the New York Botanical Garden, during September and October, are given on Saturday afternoons at 4:00 o'clock. The program follows:

The big trees of California: DR. H. A. GLEASON.

Rarer wild flowers of New York City and vicinity: MRS. N. L. BRITTON.

Some successional aspects of the local vegetation: PROFESSOR GEORGE E. NICHOLS.

The Westchester County Park System: MR. JAY DOWNER.

Dahlias (exhibit of living collection): DR. MARSHALL A. HOWE.

In Southern California: MR. HOWARD H. CLEAVES.

Autumn coloration: DR. A. B. STOUT.

The campaign against diseases of our food plants: MR. F. C. MEIER.

The flora of the Catskill Mountains: PROFESSOR OLIVER P. MEDSGER.

SCIENTIFIC NOTES AND NEWS

THE regular fall meeting of the executive committee of the American Association for the Advancement of Science will be held on Sunday, October 16. Matters to be considered by the committee should be in the hands of the permanent secretary in Washington a few days before the meeting.

PROFESSOR E. W. BROWN, of Yale University, has accepted the invitation of the American Mathematical Society to give the fifth Josiah Willard Gibbs lecture in connection with the meetings of the society and of the American Association for the Advancement of Science at Nashville, Tennessee, in December, 1927.

DR. ROBERT A. MILLIKAN, director of the Norman Bridge Laboratories of the California Institute of Technology, will give a course of six Lowell lectures in Boston beginning on April 13, 1928. His subject will be "Twentieth Century Discoveries in Physics."

A COURSE on "Recent Progress in Medicine and Surgery" will be given during the autumn at the New School for Social Research, New York City. The opening lecture will be by Dr. Simon Flexner, director of the Rockefeller Institute for Medical Research; other lectures will be by Drs. Walter B. Cannon, professor of physiology, Harvard Medical School, Boston; Dr. Lewellys Barker, emeritus professor of medicine, the Johns Hopkins University Medical School, Baltimore; Dr. Francis Carter Wood, Columbia University College of Physicians and Surgeons; Dr. Charles V. Chapin, Providence, president of the American Public Health Association, and Dr. Louis I. Dublin, of the Metropolitan Life Insurance Company. The lectures are intended for laymen, most of whom will be college graduates and some of them physicians and nurses.

WE learn from *Nature* that Professor Edward Westermarck has accepted an invitation to deliver the Frazer Lecture at Glasgow in 1928. It will be remembered that the lectureship is vested in four universities in Great Britain in rotation and this time the election falls to Glasgow. In view of the fact that the British Association will be meeting in Glasgow in 1928, the date of the lecture will be arranged to coincide with the date of the meeting.

DR. HOWARD T. KARSNER, professor of pathology in the school of medicine of Western Reserve University, has been appointed chairman of the division of the medical sciences of the National Research Council, Washington, D. C., for one year from September 16.

DR. PAUL EHRENFEST, professor of theoretical physics in the University of Leiden, has been elected a corresponding member of the Academy of Sciences at Göttingen.

M. LOUIS RAVAZ, director of the National School of Agriculture at Montpellier, has been elected a correspondent in the section of rural economics of the Paris Academy of Sciences, to succeed the late M. A. Balland.

DR. REINHARD BRAUNS, professor of mineralogy and petrography in the University of Bonn, has been elected a foreign member of the Norwegian Academy of Sciences at Oslo.

THE Russian Academy of Sciences at Leningrad has elected to membership Dr. Heinrich Zeiss, professor of tropical medicine at Moscow.

DR. HIDEYO NOGUCHI, of the Rockefeller Institute for Medical Research, was elected an honorary member of the "Société Dermatologique et Vénéréologique d'Odessa" at its meeting of May 15, when the twenty-fifth anniversary of the founding of the society was celebrated.

AT the celebration of the five hundredth anniversary of the founding of the University of Louvain, the honorary degree of doctor of medicine was conferred upon Dr. James B. Murphy, of the Rockefeller Institute for Medical Research.

DR. ARTHUR D. BUSH, Decatur professor of pharmacology, Emory University School of Medicine, Atlanta, since 1923, will retire at the beginning of the autumn term on account of ill health. His successor has not yet been appointed.

DR. HAROLD E. JONES, assistant professor of psychology at Columbia University, has been appointed director of research at the newly-created Institute of Child Welfare, of the University of California.

THE vacancy in the position of medical officer of the drug-control laboratory of the food, drug and insecticide administration, caused by the resignation of Dr. J. S. Jamieson, has been filled by the appointment of Dr. Paul McC. Lowell.

F. A. ERNST, acting chief of the Fertilizer and Nitrogen Fixation Investigations and for some time a member of the Fixed Nitrogen Research Laboratory staff, has resigned to join the engineering staff of the Atmospheric Nitrogen Corporation, at Syracuse, N. Y.

WE learn from *Nature* that Mr. Geoffrey Evans has been appointed principal of the Imperial College of Tropical Agriculture at Trinidad. Mr. Evans was in the Indian Agricultural Service from 1906 until 1926. He was for a time attached to the Queensland Government in Australia as director of cotton culture, and during this period he also worked in Fiji, Papua and New Guinea.

PROFESSOR L. BOEZ, of the hygienic institute of the University of Strasbourg, has been appointed director of the Pasteur Institute at Saigon, French Indo-China.

PROFESSOR LEON W. COLLET, of the University of Geneva, will be visiting lecturer on geology at Harvard University during the first half of the school year beginning on September 26. Professor Collet will offer a course on the "Geology of the Alps," as well as a series of lectures on "The Principles of Geology."

DR. WILLIAM F. DURAND, past-president of the American Society of Mechanical Engineers, sailed on August 16 as the official United States delegate on the International Advisory Committee on Prime Movers of the International Electrotechnical Commission. The meetings were held at Bellagio, on Lake Como, Italy, September 4 to 24. Dr. Durand also served as acting delegate on the Rating of Rivers in the place of N. C. Grover, of the Department of the Interior, the official delegate, who was unable to attend the sessions.

DR. E. HORNE CRAIGIE, who since the beginning of the year has been working in the laboratories of the Instituto Cajal in Madrid and of the Central Institute for Brain Research in Amsterdam, is in Budapest for the tenth International Congress of Zoology. At the close of the congress Dr. Craigie will return to Toronto.

BROTHER LEÓN, professor in the Collège of La Salle, Havana, who came to New York to receive the honorary degree of doctor of science from Columbia University at the commencement exercises in June, spent parts of June and July at the New York Botanical Garden, in continuation of studies of the Cuban flora, which, in cooperation with members of the garden staff, have extended over more than fifteen years.

DR. EUGENE ALLEN SMITH, emeritus professor of mineralogy and geology in the University of Alabama and state geologist since 1873, died on September 7, aged eighty-six years.

DR. WILLIAM LIBBEY, professor of physical geography at Princeton University from 1883 to 1923, died on September 6, aged seventy-two years.

JUERGEN HERMAN PAARMANN, curator of the Davenport, Iowa, Public Museum since 1902, died recently. Mr. Paarmann was born in Davenport in 1870 and was graduated from the State University of Iowa in 1901.

DR. CHARLES C. GODFREY, president of the American Association of Variable Star Observers, conducted in cooperation with the Harvard Observatory, died at Bridgeport, Connecticut, on August 31, aged seventy-one years.

RAY P. TEELE, chairman of the special advisory committee appointed by the Secretary of the Interior to investigate economic conditions of Indian irrigation projects in the West, died while investigating the Uintah irrigation project at Myton, Utah, on September 1 at the age of fifty-nine years.

DR. VICTOR G. KIMBALL, assistant professor in the veterinary school of the University of Pennsylvania, died on September 9.

THE twelfth annual meeting of the Optical Society

of America will be held at Union College, Schenectady, N. Y., October 20, 21 and 22. Headquarters will be at the Van Curler Hotel.

THE United States Civil Service Commission states that there is a vacancy in the position of senior aeronautical engineer at the Langley Memorial Aeronautical Laboratory, Langley Field, Va., at a salary of $5,000 a year, and that in view of the importance of the position in the field of aeronautical research, and in order to secure the appointment of a thoroughly qualified man for the work, an unusual method of competition will be followed to fill the vacancy. Instead of the usual form of civil service examination, the qualifications of candidates will be passed upon by a special board of examiners, composed of Dr. G. W. Lewis, director of aeronautical research, National Advisory Committee for Aeronautics; Dr. F. C. Brown, acting director of the Museums of the Peaceful Arts; Mr. Starr Truscott, aeronautical engineer, National Advisory Committee, and Messrs. A. S. Ernest and A. W. Volkmer, examiners of the Civil Service Commission. For the purpose of this examination the persons named will be examiners of the Civil Service Commission. Applications should be received not later than October 4.

APPLICATIONS for pharmacologist in the Hygienic Laboratory, Public Health Service, Washington, D. C., and vacancies occurring in positions requiring similar qualifications, must be on file with the Civil Service Commission at Washington, D. C., not later than October 11. The entrance salary is $3,600 a year. The work will be to carry on pharmacological and toxicological investigations and research. Competitors will not be required to report for examination at any place, but will be rated on their education, training, experience and fitness, and publications or thesis to be filed with the application.

A MOTION picture machine which will take 48,000 exposures a second and which will be useful in scientific and experimental work has been invented and patented in Germany. There are certain very fast operations beyond the human eye and ordinary film photography, where a scientific investigation at such high speeds has created an actual need for high-speed photography. Among these operations may be mentioned the investigation of electric discharges, electrical switching apparatus, the determination of the speed of bullets, the operation of high-speed looms and sewing machines, investigations of mental working machinery and oscillations and vibrations on almost every kind of machine, etc.

Erratum.—In the review of Eddington's book on "The Internal Constitution of the Stars," by Dr. H. H. Plaskett, printed in the issue of SCIENCE for July 22, several lines were misplaced at the bottom of the right-hand column on page 82. The passage should read:

> Of the several quantitative predictions furnished by Eddington's model, none is more striking or more general than this relation that the luminosity of a star, apart from a small factor depending upon the surface temperature, is a single-valued function of its mass. The relation contains but one disposable constant (the proportionality constant of Kramers's absorption law), and this is fixed from the mass, luminosity and effective temperature of a single star (Capella). It is then found that all thirty-seven stars of known mass and luminosity, both giants and dwarfs, lie on Eddington's mass-luminosity curve with the average residual of the order of half a magnitude.

UNIVERSITY AND EDUCATIONAL NOTES

KEUKA COLLEGE, at Penn Yan, N. Y., has received a gift of $150,000 from Ball Brothers, glass manufacturers, of Muncie, Ind. This makes a total sum of $250,000 which they have given to the college.

A CHAMBER OF COMMERCE committee in Cambridge, Mass., has reported that Cambridge property is $30,000,000 underassessed, chiefly because of the big holdings of its colleges. A conference is recommended with officials of Harvard University and the Massachusetts Institute of Technology to see what steps might be taken to halt the continuous acquisition of property by these institutions. It is asserted that as holdings were diverted to educational uses, they automatically came off the tax list, forcing up the tax rate and discouraging new developments.

PROFESSOR A. F. KUHLMAN, who has been on leave of absence during the second semester of the present academic year, working for the Social Science Research Council, resumes his work in the University of Missouri at the beginning of the academic year and will act as chairman of the department during the absence of Professor Ellwood.

DR. HARRY F. WILKINSON has been appointed assistant professor in the department of surgery, in charge of work in otolaryngology at the medical school of the University of Chicago. Dr. Wilkinson has been a fellow in otolaryngology at the Mayo Clinic for about three years.

DR. RICHARD H. MEADE, of Richmond, Virginia, has been appointed assistant professor of surgery in the University of Virginia.

M. ROUCIERE has been appointed professor of anatomy at the University of Paris, to succeed M. Nicolas; M. Loeper, professor of therapeutics, to succeed M.

Carnot; M. Tasilly, professor of physics, to succeed M. Daniel Berthelot, and M. Guérin, professor of botany, to succeed M. Guignard.

DR. EDWARD LUKAS, of the University of Graz, has been called to a professorship of folklore in the University of Tübingen.

DISCUSSION AND CORRESPONDENCE

PHILOSOPHY AND THE SCIENCES

NOTHING is more to be desired in the world of scholarship to-day than a sympathetic understanding between philosophers and scientists. Different as are their problems and their points of view, their tasks are vitally interrelated; and it is in the hope of promoting in some degree at least the necessary rapprochement that these lines are written.

The aim of every scientist, as I should conceive it, is to understand as intimately and in as great detail as possible some limited portion of our vast universe: the aim of the philosopher, on the other hand, is, not to fill out the gaps in scientific knowledge as it stands to-day, but to understand the facts that the particular sciences *have* revealed in their relation to all that is, to see things in the light of the whole. Being finite, no human thinker would dare pretend that this "synoptic view" can ever be more than the merest glimpse; but it is his hope that some such glimpse may be attained, nevertheless, however distorted in time and space that glimpse may be.

The astronomer, the physicist and the chemist, in their various ways, are interested in the composition of matter, the laws of energy and the structure of the material universe; the biologist seeks to understand the structure and activities of organisms, the conditions which make life possible and the laws of its evolution; the psychologist, when he remains within his proper field, examines in a precisely analogous fashion into the phenomena of the human (and animal) mind, with a view to analyzing and classifying these and formulating the laws of their succession and correlation. In cultivating their respective fields, the physical scientist definitely excludes vital phenomena and the whole realm of animal or human mentality from consideration; the biologist ignores the laws of non-living matter and, together with the physicist, disregards the influence of consciousness; and the psychologist concerns himself with those matters which both groups of his fellow-workers purposely and properly neglect. Moreover, in each of these domains the scientific investigator restricts himself to the question of how matter, life and mind, respectively, work—he does not inquire into their inherent nature, and still less into their relationships as parts of one great Reality. But what *is* matter? What *is* life? What *is* mind? What is the place of mind in physical nature? How are the truths of the various sciences to be unified into a great world-view? These are all questions over and above the specific programs of any one science: they are *meta*-physical, *meta*-biological, and *meta*-psychological questions. As for God, "I have no interest in that hypothesis," says science—and quite properly so; but if the follower of science is a man as well as a scientist he has an *ineradicable* interest in God which only philosophy can *intellectually* (I do not say emotionally or practically) satisfy. And the great and to many persons absorbing question of the correlation of religion and science is also a distinctively philosophical problem.

Again, philosophy and the sciences seem to differ fundamentally in their *attitudes* toward the world. The attitude of the scientist is a detached, disinterested, impersonal one: he wishes to know what are the facts about the world, quite regardless of their positive or negative value to himself or to other men; and he sets forth as his ideal the explanation, or at least correlation, of these facts in terms of the all-comprehending principle of causality, and in exclusion of any question of ends or purposes. But the philosopher is supremely interested in those very things which the scientist for his own purposes intentionally ignores: his paramount concern is that very "realm of ends" or of values which is quite properly taboo to the scientist. From this standpoint, the contention of many present-day scholars that ethics should be treated as an inductive science, "the natural history of goodness," is a complete perversion of the true place of moral philosophy in the general scheme of things. That there is a place for "ethology," the science of character as Mill proposed it, and for the "history of moral ideas" in Westermarck's phrase, there can be no doubt; but the former of these is a branch of psychology, and the latter a division of history, and both of them are scientific and so non-philosophical disciplines. The subject-matter of ethics as moral philosophy is the nature of the good as the supreme end of conduct, for as that of philosophical logic is truth, and of esthetics beauty—the value and validity of moral ideas, not merely their existence or even their evolutionary development.

When we consider religion, which is so closely interrelated with science, on the one hand, and philosophy, on the other, a quite different situation confronts us. Ethics is, indeed, a system of ideas, and so conceivably amenable to scientific treatment; and perhaps the same might even be said of theology, regarded as a theory of God and our relation to Him. But religion is not a system of ideas, religion is not

theology, religion is not a theory about life or about God or about our relation to Him: religion *is* life, it is our relation to God. Philosophy, as has been said, may intellectually satisfy man's yearnings for the infinite, and may attempt to set forth the relation between the truths of science and the truths underlying religion; but let us avoid confusing these purely intellectual endeavors with the living practical reality!

Finally, careful reflection over what has gone before should, it would seem, inevitably impel the reader to the conclusion which led in the first place to the writing of what has been here written, namely, that philosophy and the sciences, far from being enemies, rivals or even strangers, are inextricably interdependent. To science the philosopher must go for the facts he wishes to correlate, interpret and evaluate: no longer can one hope to obtain the data for philosophical investigation from the depths of his own inner consciousness, but at every step the philosopher is dependent on what science has accomplished through the use of its own empirical and analytical methods. Metaphysics *is* dependent on the work of the physicist, the biologist and the psychologist; esthetics, ethics and the philosophy of religion *are* dependent on the investigations of the psychologist and the historian; and so with the other philosophical disciplines. But there is another side to the picture also; for if the scientist contributes the materials for the philosopher to work upon, equally true is it that the philosopher has something to contribute to the scientist which may be to him in his wider-reaching human nature of equal value, namely, breadth of interest and the synoptic spirit. Each science in itself has a narrow range of interest; but under the influence of the great philosophical ideal of the unity of all knowledge and of all truth the work of the scientific investigator may be broadened, deepened and illumined to a degree which will carry him far beyond the confines of any one field, however penetrating his work in that field may be.

JARED SPARKS MOORE

THE JACOBS CAVERN MASTODON AGAIN

IN SCIENCE for October 14, 1921, Mr. J. L. B. Taylor, of Pineville, Mo., announced his discovery, in the well-known Jacobs Cavern located on his farm, of certain perforated and engraved bones. All but one of the eight or nine specimens recovered subsequently disintegrated and this surviving bone carried the incised figure of what appeared to be a mastodon. The discovery was of extreme interest and so, although Jacobs Cavern was excavated in 1903 by Professors Peabody and Moorehead, the American Museum ultimately undertook a reexamination. This was done in part by myself with results that did not warrant extended excavation. I also gave the engraved bone a prolonged examination, and on December 28, 1923, in open meeting of the American Association for the Advancement of Science, declared it as in my opinion a plain fraud.

Last year there was published as Part 6 of Volume 19 of the Anthrop. Papers of the American Museum of Natural History a brief paper entitled "The Antiquity of the Deposits in Jacobs Cavern." The author is Dr. V. C. Allison, Bureau of Mines, Pittsburgh, and his paper purports to be chronologic determinations based on the study of a stalagmite taken from Jacobs Cavern. Such studies are of interest to archeology, but until examined by one or more competent geologists the precise conclusions of this paper can hardly be accepted. Furthermore this paper gives the unfortunate impression of being, incidentally at least, an effort to rehabilitate the above-mentioned mastodon engraving.

Space prohibits extended consideration of the subject here, but I must submit the substance of my own findings with respect to this engraved bone. They are as follows: (1) The said carved bones were admittedly found in a heap of loose dirt on the cave floor and their relation to the remaining deposits is therefore indeterminable. (2) It is difficult to understand why seven out of eight bones—unless tampered with—should have completely disintegrated, when the surviving specimen is in a fair state of preservation, as are also 3,000 or more bone fragments collected in the cave in 1923. (3) The cave fauna reveals no extinct species. (4) Archeologists are not familiar with bones and shells perforated after the manner of those under discussion (see illust. p. 593, Natural History, Vol. 21). (5) The perforation of the surviving bone is fresh-looking and shows no evidence of the piece having been suspended for any length of time by a cord. (6) The specimen as a whole shows little, if any, of that wear and polish commonly found on used artifacts. (7) Archeologists are not familiar with the indicated style of art on bone in America. (8) The engravings on the specimen give the appearance of having been fitted into the well-preserved surfaces of the bone. (9) In the case of the mastodon engraving the color of the artificial incision surfaces is quite different from that of the natural bone surface. (10) All incisions show such fresh surfaces and sharp angles as could hardly have been preserved on an ancient specimen. (11) The incised lines are of such depth, regularity and precision as to preclude their having been executed with flint tools.

These and other objections were duly communicated to both the writer and the editor of the paper, and if they had been cited in full I should not now refer to the subject.

N. C. NELSON

AMERICAN MUSEUM OF NATURAL HISTORY

THE SEX RATIO OF ADULT TRICHINAE

THROUGHOUT the literature vague and contradictory statements prevail concerning the intestinal phases of the life-history of *Trichinella spiralis*. These relate especially to the sex ratio, and to data relative to the abundance and duration of the adult worms in the intestine of the host. They are due largely to the tedious and imperfect methods which have been employed for collecting the intestinal stages.

While engaged in experimental work on this parasite the writer evolved a simple and effective method of obtaining the adults in large numbers. This consists of stripping the contents of the intestine of the infected animal into a physiological salt solution and screening the adults from the débris with a small-mesh wire screen. By using this method it has been very easy to make exact observations on the intestinal worms.

White rats were fed heavy doses of trichinized flesh and beginning with the third day were killed and examined at short intervals. From one specimen, opened at the beginning of the third day, 2,176 worms were recovered; of these 1,196 were females and 980 were males. At the end of the third day 73 adults, of which 36 were males, were found in the intestine. The next rat, opened at the end of four days, had 12 adults, of which 8 were females and 4 were males, which would indicate a very light infection. At the end of six days 51 males and 63 females were found. The condition was about the same at the end of eleven days, when 73 males and 81 females were taken from the intestine. Thirteen days after feeding one of the rats contained 451 adult worms, of which 324 were females. At this time there seems to be a dropping off in the numbers of both sexes, for at the end of sixteen days only 4 adults were found, one of which was a living male. One of the females was dead and found in the feces. The diaphragm was well filled with the migrating larvae, indicating a very heavy infection. Subsequent examinations made at the end of eighteen, nineteen, twenty, twenty-one and thirty-four days did not yield any adults, while in each instance the migrating larvae or the encysted larvae (encystment beginning at the twentieth day) were found to verify the infection.

These data indicate that at the outset the males and the females are equal in numbers. There is a gradual decline in the proportions of the males up to the thirteenth day, and at this point the worms of both sexes begin to leave the intestine rapidly. This continues until the sixteenth day, when very few of either sex were found. The males and the females were both found in the intestine as late as the sixteenth day, which seems to be about the normal duration of the adults in the intestine.

REED O. CHRISTENSON

DEPARTMENT OF ZOOLOGY,
UNIVERSITY OF MINNESOTA

A NEW LOCALITY IN CHINA FOR LYTTONIA RICHTHOFENI KAYSER

DURING the years (1909–1915) that the undersigned, now of the Fifth Avenue High School, Pittsburgh, Pennsylvania, was stationed at the University of Nanking, China, as head of the department of biology and geology, he did much collecting from the Chihsia Limestone at Chihsia Shan. A representative collection of the material thus obtained was sent to the Carnegie Museum, Pittsburgh, where it has been studied. In November of 1926, Dr. Ichiro Hayasaka, head of the department of geology of the Japanese Imperial University of Formosa, visited the museum and went over this material with the undersigned. At that time it was discovered that two or three specimens of a brachiopod, tentatively identified as *Oldhamina decipiens* Waagen, were really small specimens of *Lyttonia richthofeni* Kayser.

Considerable interest attaches to this discovery because the finding of this diagnostic Permian fossil in the Chihsia limestone indicates that this limestone can no longer be classed as Dinantian, as placed by Dr. A. W. Grabau, of the Chinese Geological Survey of Peking, but instead must be regarded as Permian.

WILLIAM MILLWARD

RENNERDALE, PENNSYLVANIA

PHOTOMETRY

MR. IRWIN G. PRIEST has been good enough to send me a copy of his letter to you, dated June 21, concerning the description in my recent book "Photometry," of the instrument developed by him for heterochromatic photometry (pp. 244–5).

While agreeing, of course, that his instrument is in no wise identical, either in principle or in use with Helmholtz's "Leucoscope" it still appears to me that "Leucoscope Photometer" is a not inappropriate description of the instrument which is, in essence, a photometer in which a color match is obtained by means of the rotatory dispersion of quartz, and a brightness match by means of polarization prisms. Nevertheless it is clear that as Mr. Priest is the in-

ventor of the instrument he must necessarily be entitled to object to having any name attached to it which, in his opinion, is liable to lead to misunderstanding. I can, therefore, assure him that should a further edition of my book be called for, the alteration will certainly be made. In the meantime I feel sure Mr. Priest will agree that the description of the instrument which I have given in the text of my book is in no way misleading.

JOHN W. T. WALSH

QUOTATIONS

RESEARCH IN MEDICAL PRACTICE

RATHER more than a year ago the Ministry of Health submitted to the British Medical Association a scheme for cooperative research by panel doctors. This scheme has now been considered by the Insurance Acts Committee of the association in consultation with representatives of the Ministry of Health, and certain conclusions have been arrived at which are likely to exercise an important influence on the future of research work in general practice. Research work by general practitioners, it is felt, should not be restricted either to panel doctors or to panel patients, but should be open to all medical men who may desire to undertake it. It should be voluntary and it should be unpaid. Moreover, the subject or subjects "should be capable of being dealt with by the individual practitioner in a simple manner." This last recommendation is likely to meet with the approval of all who understand the difficulties attending any research work in general practice; it is, moreover, justified fully by the nature of the information of which the profession stands at present in need. The late Sir James Mackenzie, who was the first man in this country to recognize the necessity of continuous research work in general practice, emphasized again and again the fact that knowledge is still lacking about the most simple of human ailments. He was wont, for example, to insist that the nature of pain and the mechanism of its production are unknown, and to ask how, in these circumstances, physicians could hope to deal successfully with this commonplace symptom. His challenge still stands; but the new proposals suggest that it is about to be taken up in the spirit in which it was delivered.

The British Medical Association takes the view that the organization of the investigations to be carried out should be entrusted to itself, and proposes to make use of its machinery of divisions and branches to facilitate the work. There can be no reasonable objection to that plan provided that care is exercised to prevent research work being reduced to the level of a mere *questionnaire*. True research, as Sir Ronald Ross has so often pointed out, springs from the spirit of curiosity and the spirit of wonder and is, consequently, difficult to organize. Research workers are born, not appointed. Thus it may be hoped that there is room in the new scheme for the encouragement and assistance of individuals or groups of individuals who have, in the vast field of general practice, begun to cultivate plots of their own. Such workers have, in all periods, been the real architects of progress. They submit, as a rule impatiently, to the restrictions of "inquiries" which are addressed to them by others, but they possess always great funds of patience and of self-denial for use in their chosen labors. To discover such workers and to help them is a task of no little difficulty and delicacy, but it is a task well worth carrying out. There is room, indeed, in any liberal scheme of medical research for the individual as well as for the group or team. Information which can be obtained in the form of answers to set questions ranks by common consent lower in point of value than that kind of knowledge which inspiration and devotion are able to win.—*The London Times.*

SCIENTIFIC BOOKS

Introduction to the History of Science. Volume I, from Homer to Omar Khayyam. By GEORGE SARTON, Associate in the History of Science, Carnegie Institution of Washington. Published for the Carnegie Institution of Washington by The Williams and Wilkins Company, Baltimore, 1927. p. i–xi, 1–839.

THIS large volume is the first of several volumes in preparation which mark the most comprehensive synthesis in the history of science thus far conceived. It registers an epoch in the writing of history. Sarton defines science as "systematized positive knowledge" and to this definition gives a broad interpretation to include not only physical science, mathematics and medicine, but also the early history of philology, for "the discovery of the logical structure of language was as much a scientific discovery as, for example, the discovery of the anatomical structure of the body," also the history of religion, for "until relatively modern times, theology was an intrinsic part of science, and not only that, but, in the opinion of most men, all other sciences were subordinated to it." The clash between Greek ideals and the oriental religions (chiefly Judaism and Christianity) is "one of the greatest intellectual conflicts of history." The author includes also parts of the history of music—"indeed the theory of music was considered a part of mathematics almost until modern times." Some attention is

paid to pseudo-science—astrology, alchemy, physiognomy, oneirology—for "it is not always easy to distinguish a pseudo-science from one which is sound but imperfect." Very little space is allowed to the work of magicians because "their purpose was but too often of a sordid nature," and quite different from the ideals of theologians and scientists. The author says: "Theologians were trying to reach the same goal as the men of science; they generalized prematurely; they were walking along the same road, but much too fast. Magicians did not follow that road at all; they were sidetracked or turned in hopeless circles." There is nothing in Sarton's study to support the doctrine that magic stimulated experimental science. "Magic is essentially unprogressive and conservative; science is essentially progressive; the former goes backward; the latter, forward."

The present volume is an introduction to the history of science from Homer to Omar Khayyam. The marking of the initial and end periods by these great literary names may seem strange to one who does not remember that in Homer there are matters of interest on geography, astronomy, anatomy, medicine, surgery and metallurgy, and that Omar Khayyam was a distinguished writer on mathematics and astronomy. Early Babylonian, Egyptian and Chinese science is not given in this volume because "it is not yet possible to give a continuous account"; this early science will be presented in separate chapters later when it is expected that "our knowledge of these difficult subjects will be materially improved."

The treatment is chronological. From the ninth century B. C. down through the eleventh century, the subject matter is presented in thirty-four periods varying in length from two centuries to half a century. The comprehensiveness of Sarton's scheme appears from his consideration in each period of the contemporaneous science of all the countries of the old world which were scientifically active at that time. The broadened viewpoint thus gained may be illustrated by the seventeenth century which Henry Hallam, with a vision confined to Europe, had called the nadir of the human mind; Sarton, in a more comprehensive view, finds the first half of that century "a golden age in at least four countries—Arabia, Tibet, China and Japan." The heading of each period after the first two bears the names of one or two outstanding scientists; thus we have "the time of Thales and Pythagoras," "the time of Hsüan Tsang," etc. It is of interest to notice that of the thirty-four names, sixteen are Greek or rather Hellenistic, five are Roman, three are Chinese, two are Byzantine, one is Persian, three are Muslim, one is Western European.

The treatment of the different periods is according to a uniform plan. First comes a survey of science in the period considered, then a presentation of the individual scientists classified by the subjects (religion, philosophy, mathematics, astronomy, geography, alchemy, medicine, historiography, law, or philology) in the cultivation of which they were respectively most conspicuous. A very compressed outline of the life and work of each writer is given, followed by a bibliography which in the case of prominent men like Galen covers several pages. Sarton says: "The best way of using this work is to read the introductory chapter and the first section of succeeding chapters, and to consult the other sections only as far as may be necessary to satisfy one's curiosity or to find an answer to a definite question."

Sarton's work is written under the dominance of his conviction that the proper procedure is not to pursue first the history of some one science and then take the history of other sciences, one at the time. This tandem arrangement is repugnant to his ideals. One should study, not the history of the sciences, but the history of science. Moreover, one should not confine one's attention to any one country like Greece or India, but should take a world view of scientific achievement. Such a synthetic process alone will afford a full picture, free of distortion, of the intellectual progress of mankind.

The work is prepared with freedom from national bias and with painstaking care. If the great discovery of the precession of the equinoxes is attributed to the Greek Hipparchos, rather than to the earlier Babylonian astronomer Kidinnu, it is because the positive proof of Kidinnu's achievement has been published only recently, while Sarton's volume was going through the press.

The endeavor of the author, we take it, has been not to produce a book which would rank among the "best sellers," but a book which would be a real *vade mecum* to all serious students of the history of science. It ought to be in every college library. Readers having already a modicum of knowledge of the history of science, at least in one field, are the ones who will profit most by this publication. Dr. Sarton has the scientific and keen philosophic insight which are necessary for successful historical research in this field. He and many other modern lovers of systematized positive knowledge, when contemplating the achievements of science since the time of Homer in lifting man to higher intellectual endeavor, would hardly hesitate to invoke the scientific spirit in the words which Lucretius addressed to Epicuros: "Thou, father, art discoverer of things, thou furnishest us with fatherly precepts, and like as bees sip of all things in the flowery lawns, we, O glorious being, in like manner feed from out thy pages upon all the golden maxims, golden I say, most worthy ever of

endless life. . . . At all this a kind of godlike delight mixed with shuddering awe comes over me to think that nature by thy power is laid thus visibly open, is thus unveiled on every side."

FLORIAN CAJORI
UNIVERSITY OF CALIFORNIA

AWARDS FOR RESEARCH AT THE UNIVERSITY OF CALIFORNIA

MANY members of the University of California faculty have received awards from the research fund of the university to carry on scientific and scholarly research next year. The research fund was created by the Board of Regents in 1917–18 with an initial appropriation of $2,000. For the academic year 1927–28 the regents have appropriated $85,000 in support of specific research projects. This sum is considerably supplemented by balances available on June 30, 1927, and by liberal donations from individuals and foundations. Grants in support of research are made by the president with the advice of the Board of Research, a committee of the Academic Senate, to individual members of the university or to departments on the basis of the merits of their projects and estimates of the cost. These grants are supplementary to provisions for research in regular departmental budgets, particularly such as those of the Lick Observatory, Scripps Institution of Oceanography, Hooper Foundation for Medical Research and the Agricultural Experiment Station.

The Board of Research is composed of the following members of the faculty: A. O. Leuschner, *chairman*, E. C. Hills, C. A. Kofoid, G. N. Lewis, C. B. Lipman, K. F. Meyer, F. J. Teggart, L. B. Loeb, *secretary*.

The awards to date for research for 1927–28 are as follows:

Professor E. B. Babcock and Professor J. L. Collins, for a taxonomic study of the genus Crepis and genetic and cytological studies of Crepis hybrids.

Professor A. R. Davis and Professor D. R. Hoagland, for the study of plant growth under controlled environment.

Professor C. B. Lipman for two assistants in research on tree injection and on the essential chemical elements essential to plant growth.

Professor H. M. Evans, three awards, supplementary to donations already made to assist in research on the relations between nutrition and fertility, on the effect of the endocrines, especially the hypophysis on the gonads and in a study of the sex cycle of the cat.

Professor R. O. Moody, for a radiographic study of the abdominal viscera.

The Department of Anthropology, Professor R. H. Lowie, *chairman*, for an assistant in research in connection with ethnological and archeological survey of California.

Professor A. L. Kroeber, for an assistant in determining the successive stages of development of the textile arts in prehistoric Peru.

The Department of Bacteriology, Professor K. F. Meyer, *chairman*, for an assistant, for a study on hypersensitiveness with bacterial protein fractions.

Professor G. L. Foster, for a study of carbohydrate metabolism of muscle.

Professor D. M. Greenberg, for research in electrochemistry of protein solutions.

Professor C. L. A. Schmidt, an award supplementary to a grant already made, for an assistant in research on the dissociation constants of amino acids.

Professor E. S. Sundstroem, for a study of acclimatization to low pressures of temperature and effect of low oxygenation on cancerous rats.

Professors T. H. Goodspeed and R. E. Clausen, for genetic and cytological investigations on *Nicotiana*.

The Department of Chemistry, Professor G. N. Lewis, *chairman*, for chemical research by members of the staff as follows:

Professor W. C. Bray, for researches on the mechanism of inorganic reactions, involving the mechanism of catalytic agents in homogeneous and heterogeneous systems.

Professor W. C. Blasdale, for a study of phase relations involved in sea water or marine deposits with special reference to the extraction of valuable constituents from such deposits.

Professor G. E. K. Branch, for a study of polarization in organic molecules and their effects on the rates and methods of reactions.

Professor E. D. Eastman, for a study of high temperature equilibria of metal oxides with special reference to the reduction of the oxides of free metals, the study of the third law of thermodynamics applied to solid solutions, and the free energy of water from the study of the oxygen electrode.

Mr. W. F. Giauque, for a study of problems involving the third law of thermodynamics, and the production of extremely low temperatures by means of high paramagnetic substances.

Professor G. E. Gibson and Professor H. C. Ramsperger, for a study of the absorption spectrum of iodine bromide and related substances.

Professor G. E. Gibson and students, for (1) isotherms of gas mixtures at high pressures with a view to determination of free energy and entropy of mixing, and (2) determination of straggling of alpha particles from radium rays in various gases by the Wilson track method.

Professor T. R. Hogness, for a study of positive ray analysis with special reference to this work as a means of studying molecular reactions.

Professor J. H. Hildebrand, for (1) solubility relations in terms of Raoult's law and internal pressures, and (2) problems related to phenomena of surface tension and colloidal chemistry.

Professor W. M. Latimer, for (1) studies of the distribution of thermal energy in solids at low tempera-

tures with reference to the determination of the entropy and free energy of chemical substances, (2) problems relating to the effect of ionic sizes in solution in reference to the energy and reactivity of ions, and (3) Professor Latimer and students, the electrode potential of aluminum from the entropy of aluminum ion.

Professor G. N. Lewis, for (1) the photon theory and the nature of light, (2) the magnetic factors involved in molecule formation, and (3) photon theory applied to the rates and mechanism of chemical reactions, and the limiting entropies at high pressures and other thermodynamic problems.

Dr. A. Lachman, for (1) a study of Benzil rearrangement, and (2) auto-reduction of nitric esters to ammonia and stability of petroleum oils.

Professor A. R. Olson, for (1) experiments on the nature of light, (2) chemical effects of X-rays, and (3) resonance and ionization potentials of atoms.

Professor C. W. Porter, for (1) photochemical reactions with special reference to the synthesis of organic compounds, and (2) problems relating to organic molecular rearrangements.

Professor H. C. Ramsperger, for a study of the thermal and photochemical decomposition of azomethene and the photochemical rearrangement of chlor-acetanilid.

Professor M. Randall, for a systematic collection of activity data on electrolytes in aqueous solutions.

Dr. G. K. Rollefson, for a study of the atomic energy levels as interpreted from soft X-ray data.

Professor T. D. Stewart, for a study of the decomposition of quaternary amides and of the reactivities of ethylene and the properties of alpha cyanamides.

Professors C. Derleth and R. E. Davis, for experimental work in connection with the arch dam investigation of the Engineering Foundation.

Professor John S. Shell, for research in dental alloys.

Mr. P. Byerly, for a detailed analysis of earth motion during the passage of seismic waves of various types.

Professor N. E. A. Hinds, for a geological study of nature and metamorphic effects of granodioritic intrusives in the vicinity of Redding, California.

Department of Geology, Professor George D. Louderback, *chairman*, for researches in sedimentation and sedimentary petrology.

Professor Franz Schneider, for copying and expressage of necessary letters in connection with the publication of a volume of Gutzkow's letters in conjunction with Professor H. H. Houben, Berlin.

Professor Lucille Johnson, for a study of the colloidal nature of certain foods.

The Department of Household Science, Professor Agnes Fay Morgan, *chairman*, for the departmental research program, "occurrence and function of vitamins in human food."

Professors Agnes Fay Morgan and Katherine Scott Bishop, for investigations of the effect of salt and antirachitic vitamin deficiencies upon reproduction in rats.

Professor Ruth Okey, for studies of metabolism of women.

The Department of Hygiene, Dr. John N. Force, *chairman*, for research in communicable diseases by members of the department as follows:

Smallpox vaccinations: A survey of the potency of smallpox vaccine sold in San Francisco, by Dr. Force and Miss Eddie.

A comparison between the method for potency determination suggested by Force and Leake and a modification of the intradermal method of Groth, by Professor Beattie and Miss Lorraine Worrall.

Simultaneous changes in blood and skin following smallpox vaccinations, by Miss Bernice U. Eddie.

Diphtheria immunization: A series of observations on the effect of the corneal inoculation of guinea pigs with virulent diphtheria organisms, by Miss Beattie.

Relation of tonsils to infectious diseases, by Dr. Cunningham.

Statistical analysis of standard methods of milk counting, by Mr. Brew, Miss Beattie, Miss Wakefield, and Miss Hyde.

Diphtheria mortality: A study of the statistical correlation between diphtheria mortality and certain population factors, Mrs. Lucia.

Dr. R. G. Aitken, associate director of the Lick Observatory, for assistants in preparing printer's copy of a General Catalogue of Double Stars.

The Medical School, Professor L. S. Schmitt, acting dean, for medical research by members of the staff as follows:

Department of medicine: Cardiovascular studies, by Dr. W. J. Kerr and staff of the Department of Medicine.

Haematological studies, by Dr. E. H. Falconer.

Tuberculosis studies, by Dr. Frederick Eberson.

Studies on the action of drugs, by Dr. W. J. Kerr.

Studies of the relation of salts of certain metals to the function of Langerhans' tissue in the pancreas, by Drs. W. J. Kerr and R. E. Allen.

Department of surgery: Thyroid and appendicitis studies, by Dr. W. I. Terry.

Urological research, by Dr. F. Hinman and staff.

Neurosurgery, by Dr. H. C. Naffziger.

Department of pediatrics: Clinical studies on hypersensitiveness.

Department of obstetrics and gynecology: Studies on hemorrhage in pregnancy, carcinoma and fibroids.

Professor C. F. Gross, for research in mechanics in connection with the testing of models of various rudders as to shape of area.

Professors J. N. LeConte and Blake R. Vanleer, for an investigation of centrifugal pump losses.

Professors B. M. Woods and John E. Younger, for the study of tailspin and wing flutter.

The Department of Physics, Professor E. E. Hall, *chairman*, for research in physics by members of the department. The various projects are:

Dr. S. K. Allison, for the measurements of the relative intensities of X-ray spectral lines from different targets.

Professor R. T. Birge and students, for studies of spectral series in the band spectra of various molecules with a special reference to the relative intensities of

the various spectral terms. For this purpose a sum of money was appropriated for the purchase of a Moll microphotometer which will also be used by Professors Brackett and Hopfield and their students.

Mr. R. B. Brode, for studies on the free paths of electrons in gases and the process of ionization by electron impact.

Professor F. S. Brackett, for photographic investigations of spectra from soft X-rays to the near infra-red.

Professor F. S. Brackett and students, for accurate intensity measurements of spectral lines.

Professor E. Dershem, for a measurement of indices of refraction of elements of high atomic number for wave lengths between 1 and 20 angstroms.

Professor E. E. Hall and students, for (1) a direct measurement of the distribution of atomic and molecular velocities of various substances by a modification of the revolving plate method, and (2) the electrical and thermal conductivity of metals in strong transverse and parallel magnetic fields.

Professor J. J. Hopfield and students, for (1) a study of emission and absorption spectra of gases and vapors in the extreme ultra-violet. For this purpose, including two small vacuum spectrographs, a new 15-foot spectrograph has been built and is being put into operation. (2) The excitation of molecular spectrum of hydrogen by collisions of the second class with active nitrogen.

Mr. Arthur von Hippel, International Education Board fellow, for studies on the ionization by impact of positive rays in streams of metallic vapor.

Professor L. T. Jones, for the study of diffusion of gaseous hydrogen through heated platinum.

Professor L. B. Loeb, for a study of gaseous ion mobilities in mixtures of hydrogen with different gases.

Professor L. B. Loeb and A. Joffe, for the direct mass determination of gaseous ions by means of a high speed centrifuge.

Professor L. B. Loeb and students, for (1) direct measurement of the rate of recombination of ions in gases using X-ray ionization and a new method of measurement capable of investigating large ranges of ionic concentration, and (2) a direct measurement of electron attachment to neutral molecules using high frequency alternations to separate ions and electrons. (3) Application of Erikson air blast method to mobilities of ions in gaseous mixtures. Also other problems involving ionic mobility cataphoresis of gas bubbles in high electric fields in non-ionizing liquids and studies on the nature of mechanism of spark discharge in inert gases.

The Department of Psychology, Professor G. M. Stratton, *chairman*, for psychological research by members of the department.

Professor William Popper, for a study of the Arabic text of Ibn Taghri Birdi's "Annals."

Professor Frederick J. Teggart, for a study of migrations in Europe and Asia.

Professor J. F. Daniel, two awards, for drawings necessary to illustrate a paper on the elasmobranch fishes, and for a study of the effects of alcohol on mice.

Professor S. F. Light, for statistical investigations on termites.

The Department of Geography, Professor Carl Sauer, *chairman*, for a study of the geography of Lower California.

Professor R. Schevill, for publication of a history of the Golden Age Theater in Spain.

Professor John A. Marshall, for research in etiology of dental caries.

Professor John B. Leighly, for a study of the Finns of the Lake Superior region.

The Department of Zoology, Professor C. A. Kofoid, *chairman*, for research in zoology by graduate students under the direction of the staff.

Professor C. A. Kofoid, three awards, supplementary to grants already made to assist in a study of human intestinal Protozoa, a study of the Dinoflagellata and of the Tintinnoina of the Eastern Tropical Pacific.

The following awards were made to members of the faculty at the University of California at Los Angeles:

Dr. Carl Epling, for research work on the taxonomy of the Labiatae of South America.

Dr. A. W. Haupt, for investigations on Californian Hepaticae.

Dr. William Newton, for a study of carbohydrate transformations in vegetable and fruit tissue.

Dr. O. A. Plunkett, for studies on the Fungi and Myxomycetes of southern California.

Professor O. L. Sponsler, for research in the molecular structure of carbohydrates.

Professor A. P. McKinlay, for photostats necessary in a classification of the manuscripts of Arator.

Professor Margaret S. Carhart, for photostat reproductions of letters necessary in the editing of the correspondence of Joanna Baillie.

Dr. C. M. Zierer, for a geographic study of the Ventura County, California, coastal plain.

Dr. C. H. Crickmay, for research in the delimitation of Triassic and Jurassic systems on Harbledown Island, B. C.

Professor W. J. Miller, for a study of the geology of the San Gabriel Mountains and of Deep Spring Valley, California.

Professor Frank J. Klingberg, for assistants in a study of the anti-slavery movement in England and the results of emancipation.

Professor Louis K. Koontz, for a study of the Virginia frontier, 1763–1775.

Professor J. M. Adams, for a study of conditions governing the growth of snowflakes.

Dr. Glenn James, for an investigation of methods of summing series.

Professor S. J. Barnett, for investigations in magnetism and electrodynamics.

Professor H. W. Edwards, for a determination of the number of electrons in the K and L rings of several elements by measurements of the index of refraction using X-rays.

Professor J. W. Ellis, for research in infra-red spectroscopy.

Professor V. O. Knudsen, for studies in physiological and architectural acoustics.

Professor C. G. Haines, for a comparative study of review of legislative acts by courts.

Professor Ellen B. Sullivan, for research in delinquency and home rehabilitation.

Dr. Gordon H. Ball, for an investigation of the life histories of various intestinal Protozoa.

Professor Bennett M. Allen, for research on the influence of the endocrine glands of amphibian larvae upon growth and development.

Professor John C. Parish, for historical research in connection with a monograph on John Stuart and the Indian boundary line.

Professor Henry R. Brush, for photostat copies of manuscripts necessary in a study of French historical poetry.

SPECIAL ARTICLES

LONG-BONE LENGTH AND BODY SIZES

In going over some bone-length, body-length relations observed in a series of albino rats used as controls for another study, it was noted that a singular consistency in ratios existed, regardless of age or body size, once the animals had passed the pre-pubertal stage of development. On remarking this to Dr. H. H. Donaldson, of this institute, he reminded me of the idea attributed to Cuvier that it should be possible to reconstruct an animal from a single bone. While I have been unable to track down this statement in the literature, the figures in the accompanying table show that the principle is not at all preposterous, providing certain obvious limitations are recognized.

The ratios given in the table were derived from length measurements of the humerus, femur and body of ten or more rats of each sex of each age series from 50 days onward. The 20- and 30-day-old groups were composed of 20 animals of each sex.

The data show definitely that once puberty is established, which occurs in the albino rat at about 65 days of age, the ratios between humerus length and body length, and femur length and body length are practically constant, notwithstanding the actual increases which take place in bone and body size. Thus given a humerus or a femur of a male or female albino rat of 65 days of age or over, it is possible to compute from its length the body length of the animal from which the bone was taken, and from this the approximate body weight as well as that of the several organs, more particularly the brain and spinal cord, by the use of the "standard" values established by Donaldson.

BONE LENGTH-BODY LENGTH RATIOS OF ALBINO RATS

	Male				Female			
Age in days	Body weight gm.	Hum. L. Body L.	Fem. L. Body L.	Hum. L. Fem. L.	Body weight gm.	Hum. L. Body L.	Fem. L. Body L.	Hum. L. Fem. L.
23	27	.141	.155	.905	29	.142	.157	.903
30	41	.135	.158	.853	39	.138	.162	.855
50	75	.128	.159	.806	74	.128	.159	.805
65	121	.125	.159	.785	105	.127	.161	.785
75	133	.125	.160	.785	116	.127	.162	.785
100	162	.125	.163	.771	138	.127	.164	.776
150	263	.126	.164	.765	183	.127	.165	.773

It will be noted that, of the two bones, the humerus length bears the more constant ratio to the body length, that of the femur tending to increase slightly with age. While this increase is numerically small, its occurrence in both sexes, combined with the fact that the humerus length-femur length ratio consistently decreases with age marks the distinction as valid, and indicates that of the two the humerus is the better bone for reconstruction purposes.

FREDERICK S. HAMMETT

THE WISTAR INSTITUTE
OF ANATOMY AND BIOLOGY

DIETARY REQUIREMENTS FOR REPRODUCTION[1]

XII. THE INEFFICIENCY OF THE LACTATING MOTHER (MUS NORVEGICUS ALBINUS) TO SECRETE VITAMIN B IN THE MILK AND THE RELATION OF SUCH PHENOMENON TO INFANT MORTALITY

For the past eight years I have been attempting to induce lactating albino rats to rear and wean their

[1] Aided by grants from Eli Lilly and Co., Indianapolis, and the Committee on Scientific Research of the American Medical Association. Research paper No. 49, Journal Series, University of Arkansas.